# United States Court of Appeals for the Federal Circuit

---

**SILICON GRAPHICS, INC.,**
*Plaintiff-Cross Appellant,*

**v.**

**ATI TECHNOLOGIES, INC., ATI TECHNOLOGIES ULC,**
**AND ADVANCED MICRO DEVICES, INC.,**
*Defendants-Appellants.*

---

2008-1334, -1353

---

Appeals from the United States District Court for the Western District of Wisconsin in Case No. 06-CV-0611, Chief Judge Barbara B. Crabb.

---

Decided: June 4, 2010

---

JAMES M. BOLLINGER, Morgan, Lewis & Bockius LLP, of New York, New York, argued for plaintiff-cross appellant. With him on the brief was PHILIP L. HIRSCHHORN.

WILLIAM H. MANNING, Robins, Kaplan, Miller & Ciresi L.L.P., of Minneapolis, Minnesota, argued for defendants-appellants. With him on the brief were JACOB S. ZIMMERMAN and AARON R. FAHRENKROG.

---

Before RADER,* *Chief Judge*, LOURIE and PROST, *Circuit Judges*.

RADER, *Chief Judge*.

This case features computer graphics systems such as the type used to animate the Pixar Animation Studios ("Pixar") movies Toy Story and Wall-E. The United States District Court for the Western District of Wisconsin granted summary judgment of non-infringement in favor of defendants ATI Technologies, Inc. ("ATI Inc."), ATI Technologies ULC ("ATI ULC"), and Advanced Micro Devices, Inc. ("AMD") (collectively "ATI") on a number of claims of U.S. Patent No. 6,650,327 (the "'327 patent"). *Silicon Graphics, Inc. v. ATI Techs., Inc.*, No. 06-611, 2008 WL 4200359 (Jan. 30, 2008) ("*Summary Judgment Opinion*"). The District Court concluded that plaintiff Silicon Graphics, Inc., ("Silicon Graphics" or "SGI") did not create a genuine factual dispute on direct infringement. *Id.* at *18-20. The trial court also concluded that a license between Silicon Graphics and Microsoft Corp. (the "Microsoft license") authorized users of Microsoft operating systems to practice the claimed technology. *Id.* at *21-23. Following its summary judgment ruling, the district court held a jury trial on the validity of the '327 patent. The jury concluded that certain claims were not proved to be invalid. *Silicon Graphics, Inc. v. ATI Techs., Inc.*, 569 F. Supp. 2d 819 (W.D. Wis. 2008) ("*JMOL Opinion*").

Because the district court erroneously construed two of the three contested limitations in the '327 patent this court vacates the summary judgment on claims with those terms. This court also determines that the district court erred with respect to the effect of the Microsoft

* Randall R. Rader assumed the position of Chief Judge on June 1, 2010.

license on direct infringement. In all other respects, this court affirms.

## I.

### A.

The '327 patent teaches a graphics system and process that predominantly operates on a floating point format. In floating point format, "data is represented by the product of a fraction, or mantissa, and a number raised to an exponent." '327 patent, col.1 ll.61-65. For example, a number $n$ can be represented in base 10 by

$$n = m \times 10^e,$$

where $m$ is the mantissa and $e$ is the exponent. If $m$ equals 2 and $e$ equals 1, $n$ equals 20; if $m$ equals 2 and $e$ equals -1, then $n$ equals 0.2. The decimal point therefore "floats" based on the value of $e$.

The '327 patent discloses a number of floating point formats, including the following 8-bit format,

$$n = \text{s\_eee\_mmmm},$$

where "s" represents the sign bit (0 is for positive and 1 is for negative), "e" represents the exponent bits (000 equals 0, 001 equals 1, 010 equals 2, and so on), and "m" represents the mantissa bits (e.g., 0101 equals 5). In that 8-bit format, the largest number that can be written is 01111111, or $15 \times 2^7$. Floating point format contrasts with fixed point format, where numbers are simply portrayed by a string of bits that represent a fraction and/or an integer.

Figure 2 of the '327 patent represents a graphics program that produces interactive three-dimensional images as a pipeline through which data passes.

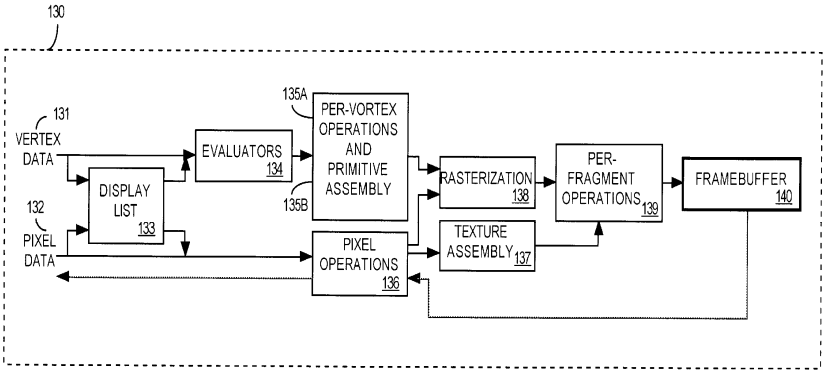


FIG. 2

The first stage of the pipeline is called the "geometry subsystem" and encompasses display list 133, evaluators 134, and per-vortex operations/primitive assembly 135. The geometry subsystem receives instructions from a computer's CPU and builds an interactive three-dimensional world. The world contains points, lines, triangles, and polygons, which the '327 patent refers to as "primitives." *Id.* col.6 ll.51-54.

The second stage of the pipeline is called "rasterization," 138. In rasterization, the three-dimensional world of primitives is converted to a displayable two-dimensional image with a three-dimensional appearance. Rasterization involves the assignment of primitives to pixels, or sub-pixels called "fragments," and it also involves making adjustments in order to provide color, transparency, texture, and shadows to the displayed image.

In the third and final stage, the frame buffer memory, 140, stores the pixel data. The pixel values are eventually read from the frame buffer and used to draw the three-dimensional images on the computer screen.

According to the '327 patent, prior art graphics systems performed rasterization in a fixed point format, which, although faster and less burdensome, resulted in less flexibility and accuracy. Generally, the range and precision of a floating point format are greater than those of a fixed point format using the same number of bits. A greater range allows a user to generate a greater variety of graphics images, and a greater precision permits the storage of a greater number of gradations of data, which gives the user a greater degree of control over the graphics images to be displayed.

Although some prior art systems performed floating point rasterization through software emulation on a fixed point hardware platform, the '327 patent explains that the prior art approach was both slow and limited. It was slow because software emulation relies on a general purpose CPU and limited because the frame buffer ultimately only stored fixed point data.

The inventors of the '327 patent "discovered . . . that it is now practical to implement some portions or even the entire rasterization process by hardware in a floating point format." *Id.* col.2 ll.55-57. In addition, the inventors discovered that it had become cost beneficial to expand the memory for the frame buffer to accommodate floating point data. For example, leaving frame buffer data in floating point format allows the graphics system to "operate directly on" the data stored in the frame buffer, "without having to unnecessarily repeat some of the preceding steps in the graphics pipeline." *Id.* col.3 ll.15-18. By operating directly on data, the CPU can more quickly refine pixel data, and a user can more quickly enhance or change an image when she, for example, changes her point of view or magnifies a point of interest.

B.

Silicon Graphics initially asserted claims from three different patents: the '327 patent; U.S. Patent No. 6,292,200 (the "'200 patent"); and U.S. Patent No. 6,885,376 (the "'376 patent"). Silicon Graphics dropped its claims of infringement with respect to the '376 patent following an early summary judgment ruling in favor of ATI. That summary judgment ruling is not at issue on appeal. On the '200 patent, ATI prevailed on its summary judgment motions of non-infringement, and Silicon Graphics has not appealed those rulings either. As to the '327 patent, Silicon Graphics originally asserted claims 1-6, 9-12, 15-18, and 21-24. Those claims remain relevant on appeal.

Claims 1-6 are all independent apparatus claims. Claim 1 is representative (important phrases underlined):

> A computer system, comprising:
>
> > a processor for performing geometric calculations on a plurality of vertices of a primitive;
> >
> > a rasterization circuit coupled to the processor that rasterizes the primitive according to a rasterization process which operates on a floating point format;
> >
> > a frame buffer coupled to the rasterization circuit for storing a plurality of color values; and
> >
> > a display screen coupled to the frame buffer for displaying an image according to the color values stored in the frame buffer;

> wherein the rasterization circuit performs scan conversion on vertices having floating point color values.

Claims 2 through 6 are substantially similar to claim 1, except that the last limitation is replaced with one or more different limitations that relate to either the rasterization circuit or, most importantly for this appeal, the floating point format. For example, in claim 3 the "scan conversion" limitation of claim 1 is replaced with "wherein the floating point format is comprised of sixteen bits in a s10e5 format."

Claims 9-12, 15, and 16 all essentially claim the same thing as claims 1-6 but are method claims. The remaining claims that Silicon Graphics asserted will be discussed in more detail as they become relevant.

C.

ATI makes and sells graphics chips and processors. AMD acquired the entire business of ATI Inc. on October 24, 2006, re-incorporated it, and now operates it as ATI ULC. Because all of the asserted claims of the '327 patent require a display (or, in the case of the method claims, "drawing the image for display on a display screen"), Silicon Graphics asserts that ATI indirectly infringes through its sales of products to computer manufacturers and end-users.

The district court granted summary judgment of non-infringement of claims 1-6, 9-12, and 15-16 of the '327 patent. *Summary Judgment Opinion*, 2008 WL 4200359, at *31. As noted, the district court based its grant of summary judgment of non-infringement in favor of ATI on two independent grounds. First, the court construed the claims to preclude direct infringement by ATI's custom-

ers. *Id.* at *18-20. Second, the court held that the Microsoft license authorized end-users of certain Microsoft products to use Silicon Graphics' patented apparatuses and methods. *Id.* at *21-23.

ATI originally contended that claims 3, 10-12, and 15-16 are invalid for lack of enablement. The district court declined to address that argument at summary judgment in light of its non-infringement ruling. *Id.* at *24. The court did address ATI's contention that claims 17 and 22 are invalid as anticipated, but denied its motion for summary judgment on that ground. *Id.* at *25.

Following the district court's summary judgment ruling, Silicon Graphics voluntarily dismissed the rest of its infringement case. The case nonetheless proceeded to trial, where ATI unsuccessfully challenged the validity of claims 17-18 and 22-23 of the '327 patent. Over ATI's objection, the district court's order directing entry of judgment stated that "*all* of . . . [ATI's] counterclaims have been addressed, withdrawn or abandoned." *Silicon Graphics, Inc. v. ATI Techs., Inc.*, 573 F. Supp. 2d 1108, 1114 (W.D. Wis. 2008) ("*Clarification Opinion*") (emphasis added). ATI then moved for judgment as a matter of law ("JMOL") and a new trial on the validity of claims 17-18 and 22-23, which the district court denied. *JMOL Opinion*, 569 F. Supp. 2d at 833-34. The district court also denied ATI's motion for costs, finding that "[u]nder the circumstances, no reason exists to award fees and costs to either side." *Id.* at 833.

ATI now appeals the denial of its post-trial motions. Silicon Graphics cross-appeals aspects of the district court's claim construction as well as its conclusion that the Microsoft license authorizes use of the invention claimed in the '327 patent. This court has jurisdiction under 28 U.S.C. § 1295(a)(1).

## II.

Silicon Graphics challenges the district court's construction of three claim terms in the '327 patent: "a rasterization process" in claims 1 through 6, "scan conversion" in claims 1 and 9 through 16, and "s10e5" in claims 3 and 11.

This court reviews claim construction without deference. *Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1455-56 (Fed. Cir. 1998) (en banc). The rules of claim construction are well known. For instance, the terms of a claim are "generally given their ordinary and customary meaning." *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc) (quotation omitted). The context in which a term appears is also of significance. *Id.* at 1314. If the specification reveals a special definition for a claim term, "the inventor's lexicography governs." *Id.* at 1316. In fact, the specification is "the single best guide to the meaning of a disputed term." *Id.* at 1315 (quotation omitted).

### A.

As noted, claims 1 through 6 of the '327 patent claim "[a] computer system, comprising . . . a rasterization circuit coupled to the processor that rasterizes the primitive according to *a rasterization process* which operates on a floating point format." (Emphasis added.) The district court construed the term "rasterization" to mean "a graphics operation that translates three-dimensional primitives into a set of corresponding fragments of pixels or both and fills them in." *Silicon Graphics, Inc. v. ATI Techs., Inc.*, No. 06-611, 2007 WL 5614112, at *11 (W.D. Wis. Oct. 15, 2007) ("*Claim Construction Opinion*"). In its summary judgment ruling, the district court noted that

its construction reflected the concept that rasterization includes "two specific aspects: (1) translating three-dimensional primitives into a set of corresponding pixels and fragments and (2) filling in those pixels or fragments" and that the "process as a whole operates on a floating point format." *Summary Judgment Opinion*, 2008 WL 4200359, at *20.

The district court's construction formed the basis of its summary judgment ruling of non-infringement for those claims that contain the "a rasterization process" term. Even though ATI's products fill in pixels or fragments using floating point values (for example, through fog and blending functions and calculation of color values), they translate primitives into pixels and fragments using fixed point values. *Id.* Thus, according to the district court, the rasterization process does not operate on a floating point format "as a whole." *Id.*

Silicon Graphics argues that the district court did not recognize that claims 1-6 refer to one or more rasterization processes, not a single process, and that not all of the rasterization processes need to be conducted in floating point format. Instead, Silicon Graphics proposes that "a rasterization process" means that "'one or more' of the rasterization processes (e.g., scan conversion, color, texture, fog, shading) operate in floating point format." Scan conversion, the argument continues, is a "translating" rasterization process and shading is an example of a "fill in" rasterization process, but "a rasterization process" does not necessarily refer to both of those processes as a single unit.

Indeed this record shows that the district court erred in requiring rasterization to occur entirely with floating point values. The '327 patent explicitly teaches that rasterization consists of multiple processes: "The *proc-*

*esses* pertaining to scan converting, assigning colors, depth buffering, texturing, lighting, and anti-aliasing are collectively known as rasterization." '327 patent col.1 ll.43-45 (emphasis added). These passages from the specification define the terms in controlling terms. *See Phillips*, 415 F.3d at 1316. Thus, when the claims refer to "*a* rasterization *process*" they are referring to one of the subsets of rasterization (e.g., scan converting, color, texture, fog, shading) listed in the specification.

The district court concluded that the claims referred to a single rasterization process: "[C]laims 1 through 6 state that the 'rasterization process' operates on a floating point format." *Summary Judgment Opinion*, 2008 WL 4200359, at *20. The claims themselves, however, specifically claims 1 through 6, recite "*a* rasterization process which operates on a floating point format . . .," not "*the* rasterization process." The use of the indefinite article "a" in the claim, when coupled with the list of processes provided in the specification, makes it clear that the claims' references to "a rasterization process" means "one or more rasterization processes." *See Tate Access Floors, Inc. v. Interface Architectural Res., Inc.*, 279 F.3d 1357, 1370 (Fed. Cir. 2002) ("It is well settled that the term 'a' or 'an' ordinarily means 'one or more.'").

The limitation "a rasterization process which operates on a floating point format" therefore means that "one or more of the rasterization processes (e.g., scan conversion, color, texture, fog, shading) operate on a floating point format." This construction is also in line with the rest of the specification. Nowhere does the specification teach that all rasterization processes must operate on a floating point format. To the contrary, the Summary of the Invention states that "[t]he present invention provides a display system and process whereby the geometry, rasterization, and frame buffer *predominately operate* on a floating

point format." '327 patent col.4 ll.8-11 (emphasis added). Similarly, the Summary of the Invention states that "*certain* rasterization processes are performed according to a floating point format." *Id.* col.4 ll.15-16 (emphasis added). And the specification also notes that certain processes within the rasterization and frame buffer processes "can be implemented in a fixed point format without departing from the scope of the present invention." *Id.* at col.12 ll.27-29. In sum, this court determines that the language of the claims in context and the specification show the accuracy of Silicon Graphics' proposed construction. Accordingly, the district court's construction of "a rasterization process" is reversed.

B.

The district court construed "scan conversion" to mean "a process that specifies which pixels of the display screen belong to which primitives on an entirely floating point basis." *Claim Construction Opinion*, 2007 WL 5614112, at *7. The district court premised its summary judgment ruling of non-infringement on that construction because ATI's accused products do not perform scan conversion entirely in floating point, but use fixed point "x" and "y" spatial coordinates to translate primitives to pixels. *Summary Judgment Opinion*, 2008 WL 4200359, at *6, *19. Silicon Graphics argues that the claims do not require "scan conversion" to be entirely in floating point, but that the term simply means "specifying primitives to pixels or fragments."

The specification and the rest of the record supports the district court's construction of "scan conversion." The Summary of the Invention in the '327 patent begins as follows:

> The present invention provides a display system and process whereby the geometry, rasterization,

> and frame buffer predominately operate on a floating point format. . . . In particular, all color values exist as floating point format. Furthermore, certain rasterization processes are performed according to a floating point format. *Specifically, the scan conversion process is now handled entirely on a floating point basis.*

Col.4 ll.8-18 (emphasis added). Nothing else in the specification indicates that the statement in the Summary of the Invention was merely an embodiment of the present invention. Although the specification does repeatedly suggest that "one or several of [the disclosed operations] can be performed in fixed point without departing from the scope of the present invention," col.11 ll.40-42; *see* col.11 ll.55-56 and col.12 ll.29-33, the specification never states that scan conversion is one of those operations. To the contrary, when the specification refers to the specific process of "converting a projected point, line, or polygon, or the pixels of a bitmap or image, to fragments, each corresponding to a pixel in the frame buffer," it also teaches that "this rasterization process is performed *exclusively* in a floating point format." Col. 11 ll.7-12 (emphasis added). Thus general language in the specification permitting some operations to be done in fixed point does not work to contradict the specific language that requires scan conversion in floating point.

Silicon Graphics argues that the district court's claim construction makes claim 1 and 9 redundant, since those claims specify that scan conversion is performed on vertices having "floating point color values." It would be unnecessary to specify the nature of the color values, Silicon Graphics argues, if scan conversion were to be done entirely in floating point. To the contrary, performing on vertices having floating point color values is not necessarily the same thing as performing on an entirely

floating point basis. For example, an operation might be executed on an entirely floating point basis even if the color values that are used as inputs are stored in fixed point, so long as the color values are translated to floating point before the operation executes. The specification recognizes this distinction, as it states both that "all color values exist as floating point format" and "scan conversion is handled entirely on a floating point basis." *Id.* col.4 ll.15-18 (summary of invention). This court therefore affirms the district court's construction of "scan conversion."

C.

The district court construed the term "s10e5" to mean "a 16 bit floating point format composed of one sign bit, ten mantissa bits, and five exponent bits, with an exponent bias of 16." *Claim Construction Opinion*, 2007 WL 5614112, at *12. Silicon Graphics disputes whether the construction should have included the exponent bias. ATI's accused devices, in contrast to the district court's claim construction, all have an exponent bias of 15. *Summary Judgment Opinion*, 2008 WL 4200359, at *18.

An exponent bias allows for the exponent bits in a floating point format to represent either a positive or negative exponent without using an additional bit. An exponent bias of 16 means that the actual exponent is found by subtracting 16 from the number represented by the exponent bits. For example, if the exponent bits are set to 00000 in the formula

$$n = \text{s\_mmmmmmmmmm\_eeeee}$$

where "s" represents the sign bit, "m" represents the mantissa bits, and "e" represents the exponent bits, then the actual exponent is equivalent to 0 − 16, or -16. The

largest exponent in that example, e=11111, is equivalent to 31 − 16, or 15.

The district court's construction of "s10e5" was incorrect. In construing the term, the district court relied on the following statement in the specification:

> The 16-bit floating point format utilized in one embodiment of the present invention is designated using the nomenclature 's10e5', where 's' specifies one (1) sign bit, '10' specifies ten (10) mantissa bits, and 'e5' specifies five (5) exponent bits, *with an exponent bias of 16*. Fig. 3 defines the represented values for all possible bit combinations for the s10e5 format.

'327 patent col.8 ll.45-50 (emphasis added). As the statement itself makes clear, however, that description of "s10e5" is given as a part of "one embodiment of the present invention." A construing court's reliance on the specification must not go so far as to "import limitations into claims from examples or embodiments appearing only in a patent's written description . . . unless the specification makes clear that 'the patentee . . . intends for the claims and the embodiments in the specification to be strictly coextensive.'" *JVW Enters., Inc. v. Interact Accessories, Inc.*, 424 F.3d 1324, 1335 (Fed. Cir. 2005) (quoting *Phillips*, 415 F.3d at 1323).

The specification does not suggest that the patentee intended to make that embodiment of s10e5 coextensive with the claims. Elsewhere, the specification defines "s10e5" without reference to bias. The Abstract states, "In one embodiment, a 16-bit floating point format consisting of one sign bit, ten mantissa bits, and five exponent bits (s10e5), is used to optimize the range and precision afforded by the 16 available bits of information." Similarly, the Summary of the Invention states,

> However, it has been discovered that one floating point format, known as "s10e5," has been found to be particularly optimal when applied to various aspects of graphical computations. As such, it is used extensively throughout the geometric, rasterization and frame buffer processes of the present invention. To optimize the range and precision of the data in the geometry, rasterization, and frame buffer processes, this particular s10e5 floating point format imposes a 16-bit format which provides one sign bit, ten mantissa bits, and five exponent bits.

*Id.* col.4 ll.27-37. Those more general statements trump the definition found in the embodiment on which the district court relied.

The district court also justified its construction by noting that the claims in the '327 patent sometimes refer to s10e5 and other times, in dependent claim 18 for example, refer to data "comprised of one sign bit, ten mantissa bits, and five exponent bits." The district court concluded that "[t]he claims refer to other 16-bit formats, but ['s10e5'] is one that the plaintiff chose to define with greater detail." *Claim Construction Opinion*, 2007 WL 5614112, at *12. But this difference does not compel the district court's construction because the terms are used in different contexts. The term "s10e5" is used in claims that define a floating point format, whereas the claims use the unabridged language to define the composition of data. More precisely, claim 3 requires "the floating point format [to be] comprised of sixteen bits in a s10e5 *format*," whereas claim 18 requires "the [floating point format] specification [to be] comprised of 16 bits of data and *the data* [to be] comprised of one sign bit, ten mantissa bits, and five exponent bits." The patent specification similarly only refers to the floating point's format as s10e5, not the

data itself. It is justifiable that the claims would follow the same convention, even if the two claim terms mean essentially the same thing. Accordingly, the district court's construction of "s10e5" is also reversed.

III.

The district court also granted summary judgment of non-infringement in favor of ATI based on the Microsoft license. As the district court held, and the parties do not dispute, "licensed use of a product does not constitute direct infringement and, therefore, does not support a finding of indirect infringement." *Summary Judgment Opinion*, 2008 WL 4200359, at *22 (citing *Aro Mfg Co. v. Convertible Top Replacement Co.*, 377 U.S. 476, 497-99 (1964) ("[I]f the purchaser and user could not be amerced as an infringer certainly one who sold to him . . . cannot be amerced for contributing to a non-existent infringement.")).

The Microsoft license states that Microsoft's "Authorized Licensees" are immune from suit (the "Immunity Provision")

> under [the '327 patent] for the formation, use, sale, license, importation or other distribution or transfer of any combination of third party products with a Subject Product originally provided by MICROSOFT, *but only to the extent that* (i) for any given patent claim of [the '327 patent], such claim would not be directly infringed by the third party product *separate and apart from* the combination with the Subject Product, and (ii) MICROSOFT'S provision of said Subject Product would, absent this Agreement, result in MICROSOFT's liability for infringement (including, without limitation, contributory infringement) of said claim. The determination of infringement in (ii) above shall as-

> sume the existence of any necessary knowledge or intent requirements required to constitute infringement.

ATI relies on this license to argue that end-users of any Microsoft Windows operating system are licensed and therefore there can be no direct infringement to support Silicon Graphics' claims of indirect infringement. Because, as explained in Part II, *supra*, this court affirms the district court's summary judgment ruling of non-infringement with respect to those claims that contain the term "scan conversion" (claims 1, 9-12, and 15-16), this court only evaluates the Microsoft License with respect to claims 2 through 6 of the '327 patent, all of which are apparatus claims.

Delaware law governs the Microsoft license. Under Delaware law, contract interpretation is a legal question. *Honeywell Int'l Inc. v. Air Prods. & Chems., Inc.*, 872 A.2d 944, 950 (Del. 2005). Summary judgment is therefore "a proper framework for enforcing unambiguous contracts." *OSI Sys., Inc. v. Instrumentation Corp.*, 892 A.2d 1086, 1090 (Del. Ch. 2006). Here, however, this court concludes that the district court erred in enforcing this contract at the summary judgment stage because it relied on an erroneous assumption of what constitutes infringement of an apparatus claim.

Under the first prong of the Immunity Provision, an Authorized Licensee is not authorized to use a "third party product," here, an ATI graphics chip or processor, if the third party product would directly infringe "separate and apart from . . . combination with [a] Subject Product." The parties do not dispute that a Microsoft Windows operating system is a "Subject Product." It is also undisputed that the products do not function without an oper-

ating system. As the district court noted, "[w]hen the accused products are not combined with an operating system . . . they cannot perform rasterization or frame-buffering." *Summary Judgment Opinion*, 2008 WL 4200359, at *23. Absent performance, the district court held, there could be no infringement. *Id.*

The district court erred in assuming that direct infringement requires the performance of all of the elements in these apparatus claims. In addition to the actual use of the product described, infringement of an apparatus claim occurs when the invention is, among other things, made or sold in the United States. 35 U.S.C. § 271. Thus, even absent its use (or performance), this court has held that an apparatus claim directed to a computer that is claimed in functional terms is nonetheless infringed so long as the product is designed "in such a way as to enable a user of that [product] to utilize the function . . . without having to modify [the product]." *Fantasy Sports Props., Inc. v. Sportsline.com, Inc.*, 287 F.3d 1108, 1118 (Fed. Cir. 2002). Where, as here, a product includes the structural means for performing a claimed function, it can still infringe "separate and apart" from the operating system that is needed to use the product.

*Fantasy Sports* helps to understand this principle. In that case, the patent in suit claimed "[a] computer for playing football based upon actual football games, comprising . . . means for scoring performances of . . . actual football players based upon actual game scores . . . wherein said players . . . receive bonus points." *Id.* at 1111. The district court held on summary judgment that one of the defendants' products, Commissioner.com, could not directly infringe because it was not a separate fantasy football computer game but merely a software tool. *Id.* at 1112. This court vacated and remanded on the grounds that no reasonable juror could find that the Commis-

sioner.com product is not software installed on a computer for playing fantasy football. *Id.* at 1119. The software, although not in and of itself a computer for playing fantasy football games, infringed so long as a user could activate "the functions programmed into a piece of software . . . only [by] activating means that are *already present in the underlying software*." *Id.* at 1118. "In other words, an infringing software must include the 'means for scoring . . . bonus points' regardless whether that means is activated or utilized in any way." *Id.*

Claims 2 through 6 of the '327 patent require "a rasterization circuit coupled to the processor that rasterizes" primitives in a certain way and "a frame buffer coupled to the rasterization circuit for storing" certain data. Even if the products cannot rasterize or store absent an operating system, they may include a rasterization circuit and a frame buffer for doing so. If they do, they infringe separate and apart from the operating system, and the Immunity Provision does not apply. Nothing in the record suggests that the Microsoft Windows operating system provides anything other than a way to activate the accused product. Because infringement of the claims at issue does not turn on activation, this court vacates the summary judgment ruling of noninfringement based on the Microsoft License and remands for the district court to determine whether any genuine issues of material fact would allow ATI to continue to rely on the Microsoft License at trial.

## IV.

At trial, ATI relied on four allegedly prior art references to argue that independent claims 17 and 22 of the '327 patent and their dependent claims 18 and 23, respectively, are anticipated. Independent claim 17 reads as follows (emphases added):

In a computer system, a method for operating on *data stored in a frame buffer*, comprised of:

> *storing* the data in the frame buffer in a floating point format;
> *reading* the data from the frame buffer in the floating point format;
> *operating directly on* the data in the floating point format; and
> *writing* the data to the frame buffer in the floating point format;
> wherein the steps of writing, storing, and reading the data in the frame buffer in the floating point format are further comprised of a specification of the floating point format, wherein the specification corresponds to a level of range and precision.

Independent claim 22 reads as follows (emphases added):

A computer system having a floating point frame buffer for storing a plurality of floating point color values;

> wherein the floating point color values are *written to, read from, and stored in the frame buffer* using a specification of floating point color values that corresponds to *a level of range and precision*.

As a reminder, the frame buffer is the final staging area for pixel value data before that data is drawn on the screen. The district court construed the term "frame buffer" to mean "the portion of computer memory for storing color values *during* or after rasterization." *Claim Construction Opinion*, 2007 WL 5614112, at *10 (emphasis added). The reference to "during" in the district court's construction of the term "frame buffer," which is not in dispute on appeal, becomes apparent upon a closer

look at the '327 patent's specification. The specification explains in the Background of the Invention that the information stored in the frame buffer "is a rich source of data that can be used in subsequent graphics calculations." Col.3 ll.19-29. In the prior art, however, data would need to be read from the frame buffer and input into the graphics pipeline at or near the beginning "so that the data could be recalculated in the floating point format to restore the required precision and range." *Id.* The specification posits that, in accordance with the claimed invention, "a computing system could be designed with processors dedicated to operating on the frame buffer, resulting in additional improvements in the speed at which graphics calculations are performed." *Id.* col.3 ll.45-48.

The jury found that ATI did not prove that any of claims 17-18 or 22-23 were anticipated by clear and convincing evidence. ATI challenged those findings in a JMOL motion and a motion for a new trial, the denial of which ATI now appeals.

A.

This court applies regional circuit law in reviewing the denial of a motion for JMOL. *Seachange Int'l, Inc. v. C-Cor Inc.*, 413 F.3d 1361, 1367 (Fed. Cir. 2005). In the Seventh Circuit, an appellate court's inquiry is "limited to the question whether the evidence presented, combined with all reasonable inferences permissibly drawn therefrom, is sufficient to support the verdict when viewed in the light most favorable to the party against whom the motion is directed." *Campbell v. Miller*, 499 F.3d 711, 716 (7th Cir. 2007) (quotation omitted). To show that a patent claim is invalid as anticipated, the accused infringer must show by clear and convincing evidence that a single prior art reference discloses each and every element of a

claimed invention. *Electro Med. Sys., S.A. v. Cooper Life Scis.*, 34 F.3d 1048, 1052 (Fed. Cir. 1994).

The first reference on which ATI relies is THE OPENGL GRAPHICS SYSTEM: A SPECIFICATION (VERSION 1.1) ("OpenGL"). OpenGL is SGI's own graphics interface. This reference is an interface specification. In other words, OpenGL teaches ways to design hardware and software so that the two will be compatible. OpenGL provides high-level commands and controls that call and provide inputs to and specify outputs from a set of computer commands without describing any specific implementation for those commands. Importantly, OpenGL discloses a frame buffer that consists of, among other things, an accumulation buffer.

One of the commands to the accumulation buffer is defined in OpenGL as

void **ClearAccum**( float *r*, float *g*, float *b*, float *a* );

That command takes "four floating-point arguments that are the values, in order, to which to set the [color indices] R, G, B, and A values of the accumulation buffer." OpenGL also teaches five operations—ACCUM, LOAD, RETURN, MULT, and ADD—that can be performed on data in the accumulation buffer through the command void **Accum**( enum *op*, float *value* ). For example, OpenGL describes the MULT operation as multiplying each R, G, B, and A value in the accumulation buffer by *value* and then returning the scaled color components to their corresponding accumulation buffer locations.

The district court correctly upheld the jury's conclusion that OpenGL did not anticipate because "[i]t is not hardware itself and it does not include any description of the underlying hardware that the program might be running." *JMOL Opinion*, 569 F. Supp. 2d at 828. ATI

raises a number of issues regarding OpenGL, but that reference does not anticipate because it does not describe the hardware of the frame buffer in any detail. ATI argues that OpenGL indeed discloses hardware, relying on Silicon Graphics' own concession that Figure 2 of the '327 patent is nothing more than the hardware architecture for OpenGL machines. That argument misses the mark. OpenGL, by its nature as an interface specification, does not describe implementation of any hardware. It is undisputed that, based on the court's claim construction, the frame buffer is a hardware buffer because it resides in computer memory. Even though OpenGL describes commands that take floating point values, the specification provides no disclosure as to whether the values are actually, for example, stored in the frame buffer in a floating point format, as independent claims 17 and 22 require. Indeed, co-inventor Dr. John Airey of Silicon Graphics testified that its implementation of the accumulation buffer was in fixed point. Thus, sufficient evidence supports the jury's conclusion that OpenGL fails to disclose the storing in, reading from, operating directly on, and writing to the frame buffer data in floating point format that is required by independent claims 17 and 22.

ATI also relied on U.S. Patent No. 6,567,083 ("Baum"), entitled "Method, System, and Computer Program Product for Providing Illumination in Computer Graphics Shading and Animation." Baum, like OpenGL, references a hardware architecture that resembles Figure 2 of the '327 patent. Baum also teaches that

> The present invention can be implemented on computer systems that use fixed-point and/or floating point arithmetic. In particular, routine 100 is performed using fixed point arithmetic when a graphics system, such as the current InfiniteReality system by Silicon Graphics, Inc.,

> does not support floating point values in all stages of the hardware rendering pipeline.

ATI argues that this quote teaches that fixed-point arithmetic is the exception, used only if a particular machine does not support a full floating-point pipeline.

The district court correctly denied ATI's JMOL motion with respect to Baum because substantial evidence supports the conclusion that Baum does not disclose a floating point format that "corresponds to a level of range and precision," as required by independent claims 17 and 22. Baum does not expressly discuss a floating point format. ATI argues that Baum discloses a floating-point specification by teaching that the floating point pipeline may be implemented in specific, commercially available machines, including Java-based computers. ATI's expert, Dr. Potel, testified that using floating point in Java-based systems necessarily refers to an IEEE single-precision floating-point number.

SGI's counsel, however, severely damaged Dr. Potel's credibility. On direct examination, Dr. Potel presented five slides to the jury that discussed the InfiniteReality system to which Baum refers, highlighting in yellow the phrase "floating point values in all stages" on each of those slides. On cross, however, SGI's counsel emphasized to the jury that Dr. Potel's presentation did not highlight the three words that preceded that phrase: "does not support." On this record, the jury had every right to discount Dr. Potel's description of Baum once his testimony was impeached. Without Dr. Potel's testimony, the record contains no evidence that Baum discloses a floating point format that corresponds to a level of range and precision.

The RenderMan Interface ("RenderMan"), like OpenGL, is an interface specification that ATI points to as

an anticipatory reference. It describes itself as a "standard interface between modeling programs and rendering programs capable of producing photorealistic quality images." It discloses an "imaging pipeline" that uses floating-point values. SGI's expert, Dr. Stevenson, testified that the purpose of RenderMan was to expressly avoid teaching any hardware implementation so that a person could program a RenderMan application that would be compatible with any number of hardware implementations. The jury also heard testimony that Pixar in fact had created a separate hardware implementation of RenderMan with its software product PhotoRealistic RenderMan, which was used to develop Toy Story. For the same reason that sufficient evidence supports the jury's verdict of no invalidity with respect to OpenGL—namely, the reference does not describe an underlying hardware implementation—sufficient evidence also supports the jury's verdict with respect to RenderMan.

Finally, ATI relies on U.S. Patent No. 5,528,741 ("Lucas"). Lucas is directed primarily to generating integer pixel values from floating point values using a lookup table. Those integer pixel values are then put into a frame buffer, which, in turn, generates RGB signals for a display device.

There was sufficient evidence to support a conclusion here that Lucas does not disclose the "operating directly on the data in the floating point format" method step of claims 17 and 18 because the floating point values in Lucas are converted to integer (fixed point) values before they are stored in a frame buffer. The district court did not construe the term "operating directly on" during claim construction, holding that the term's ordinary meaning controlled. *Claim Construction Opinion*, 2007 WL 5614112, at *14. The testimony of both sides' experts at

trial indicates that that term was not fundamentally in dispute, thus, it was proper for the district court not to construe it. *See O2 Micro Int'l Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008) (recognizing that "district courts are not (and should not be) required to construe *every* limitation present in a patent's asserted claims" but only "[w]hen the parties present a fundamental dispute regarding the scope of a claim term"). Indeed, both experts agreed that "operating directly on" means that the data in the frame buffer is always in floating point. Only with reference to Lucas did Dr. Potel change his opinion and allege that "operating directly on" was met where floating point numbers are taken through a circuit and come out as fixed-point. This argument contradicts the ordinary meaning of "operating directly on the data in floating point format," and therefore the jury's finding of no anticipation was justified.

Similarly, with respect to independent claim 22, ATI fails to identify where Lucas discloses that "*floating point color values* are written to . . . and stored in the frame buffer." The district court's denial of ATI's JMOL motion is therefore affirmed.

B.

This court also applies regional circuit law in reviewing the denial of a motion for a new trial. *Seachange*, 413 F.3d at 1367-68. In the Seventh Circuit, a denial of a request for a new trial is reviewed for abuse of discretion. *ABM Marking, Inc. v. Zanasi Fratelli, S.R.L.*, 353 F.3d 541, 543 (7th Cir. 2003). "A new trial may be granted only if the jury's verdict is against the manifest weight of the evidence," *King v. Harrington*, 447 F.3d 531, 534 (7th Cir. 2006), or if the trial was "unfair to the moving party." *Miksis v. Howard*, 106 F.3d 754, 757 (7th Cir. 1997). As

demonstrated above, the jury's verdict is not against the manifest weight of the evidence.

ATI argues that the trial was unfair because the district court allowed the jury to consider Silicon Graphics' claim construction arguments. Specifically, ATI argues that Silicon Graphics unfairly argued to the jury that the method steps in claim 17 were required to be performed in the order listed and that the district court adopted Silicon Graphics' construction in its jury instructions. ATI also argues that the district court left for the jury to decide whether the claims were limited to specialized hardware. Both of ATI's arguments are without merit.

As to the order of the claimed method steps, the district court noted in denying ATI's post-trial motions that it was ATI's Dr. Potel who first raised the question at trial of whether the order of steps was important with respect to claim 17. Having opened the door, ATI cannot contend that Silicon Graphics' counterarguments were unfair.

Even though Silicon Graphics' counterarguments were fair, however, this court must still examine the propriety of the district court's resolution of the order-of-steps question. "An erroneous instruction on claim interpretation that affects the jury's decision on anticipation is grounds for a new trial." *Seachange*, 413 F.3d at 1381. A party seeking to set aside a judgment based on erroneous jury instructions must establish that (1) it made a proper and timely objection to the jury instructions, (2) it requested alternative instructions that would have remedied the error, (3) the given jury instructions were legally erroneous, and (4) the errors had prejudicial effect. *Id*.

With the order of steps in question, the district court construed the claim, instructing the jury as follows: "A method claim may expressly or implicitly require that the method steps be performed in a particular order. In this

case, the order is implied in the patent." ATI had objected to that instruction, proposing the following instruction instead: "Although a method claim necessarily recites the steps of the method in a particular order, as a general rule the claim is not limited to performance of the steps in the order recited."

On appeal, ATI argues that the district court's jury instruction was erroneous because it requires that the steps be performed in the order they are listed, i.e., that the steps must start with "storing." ATI contends that instead the claim should have been construed to allow, for example, step one to be operating directly on the data in the floating point format, step two to be writing the data to the frame buffer, step three to be storing the data in the frame buffer, and step four to be reading the data from the frame buffer. And, to complete its argument under *Seachange*, ATI argues that it was prejudiced by the district court's jury instruction because Silicon Graphics made the point during closing arguments that to find anticipation it had to find a reference that "starts by the storing, followed by reading, operated on third, and then writing the data back to the frame[ ]buffer fourth."

This court need not decide whether the district court erroneously instructed the jury that "the order [of operation] is implied in the patent." In simple terms, ATI shows no prejudice to its position from this instruction. Instead, ATI only argues that it was prejudiced by Silicon Graphics' attorney argument. But there is a difference between the district court's instruction and the arguments that Silicon Graphics made to the jury. The jury instruction, unlike Silicon Graphics' closing arguments, did not require the claimed method to begin with the "storing" step. As the district court essentially noted in its *JMOL Opinion*, the jury instruction simply required the process to be circular, i.e., even if "the first step is 'reading,' the

*next* is 'operating directly on,' then 'writing' and back to 'storing.'" 569 F. Supp. 2d at 826 (emphasis added). In other words, regardless where in the method one starts, the jury charge can be read to mean that the subsequent steps must occur in the order that they are listed in the claim. ATI argues for nothing more on appeal. ATI cannot make out a claim that the district court abused its discretion in declining to order a new trial when the claim construction that it challenges was not actually adverse to it.

With respect to whether Silicon Graphics improperly argued that the claims are limited to specialized hardware, ATI's argument fails because it ignores the court's uncontested claim construction. As discussed, the district court's construction of "frame buffer," which was resolved well before trial, requires a "portion of computer memory." *Claim Construction Opinion*, 2007 WL 5614112, at *10. ATI does not contend that "memory" is something other than hardware. The district court recognized this, noting that "[e]ven defendants' expert . . . agreed that the claims at issue in the '327 patent cover hardware." *JMOL Opinion*, 569 F. Supp. 2d at 826. The district court did not abuse its discretion in refusing to grant a new trial.

V.

ATI also challenges the district court's ruling that ATI waived or abandoned its invalidity counterclaims on any patent claims that ATI failed to litigate through trial. The Court of Appeals for the Seventh Circuit reviews the factual determinations upon which a district court predicates a finding of waiver for clear error and the legal question of whether the conduct amounts to waiver de novo. *e360 Insight v. The Spamhaus Project*, 500 F.3d 594, 599 (7th Cir. 2007). Because "[t]he line between waiver and [abandonment] is often blurry," this court will

evaluate whether ATI abandoned its invalidity counterclaims under the same standard. *United States v. Garcia*, 580 F.3d 528, 541 (7th Cir. 2009).

In order to understand the district court's ruling, it is necessary to look at the events leading up to trial in more detail. Following the district court's summary judgment ruling of non-infringement as to certain claims, the district court held—in the same opinion—that ATI's invalidity counterclaims as to those claims were rendered moot, citing *Garmin Ltd. v. TomTom, Inc.*, 468 F. Supp. 2d 988, 994 n.1 (W.D. Wis. 2006). *Summary Judgment Opinion*, 2008 WL 4200359, at *24. Also in that opinion, however, the district court did address ATI's invalidity counterclaims on claims 17 and 22, apparently because the court had made no non-infringement ruling on those claims. *Id.*

The day after it issued its summary judgment opinion, the district court held a final pretrial conference. At the conference, Silicon Graphics announced the voluntary dismissal of the remaining part of its infringement case and requested that the court therefore dismiss ATI's declaratory judgment counterclaims of invalidity. In a responsive brief, ATI argued that it was entitled to pursue its declaratory judgment invalidity counterclaims "regardless of whether SGI dismisses its infringement claims" so that it may "resolve the dispute once and for all." ATI contended that this case was different from *Garmin* because in *Garmin* the defendant had moved for summary judgment of invalidity on claims that the patentee had never asserted. In its brief to the district court, ATI vacillated between addressing its "invalidity counterclaims" generally ("This Court has declaratory judgment jurisdiction over ATI's invalidity counterclaims") and claims 17, 18, 22, and 23 in particular ("ATI should have its opportunity to invalidate [claims 17, 18, 22, and 23] in a trial by jury.").

The district court ruled from the bench that it would proceed to trial. At trial, ATI only attacked the validity of claims 17-18 and 22-23 of the '327 patent. Following trial, the district court ordered that entry of judgment was appropriate "[n]ow that all of the claims and counterclaims have been addressed, withdrawn or abandoned." *Silicon Graphics, Inc. v. ATI Techs., Inc.*, No. 06-cv-611, 2008 WL 2828813, *1 (W.D. Wis. Feb. 15, 2008). Apparently surprised by the reference to waiver and abandonment, ATI filed a request to delete any such reference with respect to any invalidity claims raised in its counterclaims but not pursued at trial.

The district court denied ATI's request, noting that ATI "mounted a vigorous campaign to win reversal of a ruling that [its] invalidity . . . counterclaims were moot." *Clarification Opinion*, 573 F. Supp. 2d at 1113. That "campaign," the district court noted, was based primarily on the goal of promoting judicial economy, and ATI did not "explain how it would serve the same goal to permit [it] to keep [its] untried claims alive." *Id.*

The district court did not clearly err. It appropriately characterized ATI's jurisdictional arguments as addressing its invalidity counterclaims as a whole. It is a claimant's burden to keep the district court clearly apprised of what parts of its claim it wishes to pursue and which parts, if any, it wishes to reserve for another day. *See e360 Insight*, 500 F.3d at 600 ("It was not erroneous to treat [a] voluntary abandonment of defenses, raised but not pursued, as a waiver."). If ATI wished to reserve its right to pursue some of its invalidity counterclaims later, it was incumbent on ATI to expressly request that the district court dismiss those counterclaims without prejudice rather than ask the district court to infer an implicit request based on ambiguous statements.

To be clear, although this court is vacating the district court's non-infringement ruling on claims 2 through 6 of the '327 patent, ATI is nevertheless precluded from relitigating its invalidity counterclaims with respect to those claims. ATI does not argue on appeal that it chose to ignore those invalidity counterclaims because of the district court's claim constructions. *See CytoLogix Corp. v. Ventana Med. Sys., Inc.*, 424 F.3d 1168, 1176 (Fed. Cir. 2005) (refusing, after correcting the district court's claim construction, to allow new trial on certain invalidity theories because those arguments were not preserved). Normally, it is the responsibility of litigants that come before this court to narrow the issues in a case, not broaden them. Just as it was ATI's burden to expressly inform the district court if it wished to dismiss its invalidity counterclaims without prejudice, ATI also had the burden of informing this court whether and in what sense an adverse claim construction ruling would affect the district court's disposition of ATI's invalidity counterclaims. It failed to do so, and it has not established that it deserves a second bite at invalidity on remand.

VI.

Finally, ATI argues that the district court erred in declining to award it costs under Rule 54 of the Federal Rules of Civil Procedure. The district court refused to award costs to ATI under Rule 54 because "neither side prevailed and neither side lost." *JMOL Opinion*, 569 F. Supp. 2d at 833. ATI argues to this court that it prevailed because it won on summary judgment of non-infringement. Because we vacate the district court's summary judgment of non-infringement, ATI has not yet prevailed on any issue. We therefore leave it to the parties to reintroduce the prevailing party issue on remand as it becomes relevant.

## VII.

The district court held that its constructions of the terms "a rasterization process," "scan conversion," and "s10e5," independently required summary judgment of non-infringement of claims 1-6, 9-12, and 15-16. Because the district court erroneously construed "a rasterization process" and "s10e5," and because ATI is not entitled to summary judgment of non-infringement based on the Microsoft license, this court vacates the district court's non-infringement ruling with respect to claims 2-6 (the claims in which only those terms appear) and remands for consideration in light of the correct construction. In all other respects, for the foregoing reasons, the district court's judgment is affirmed.

**AFFIRMED IN PART, VACATED IN PART, and REMANDED**